

garded as the cause of important or adaptive specific change. Therefore, if it is the case that "so many naturalists accept the theory of natural selection as an exclusive explanation of the evolution of existing species," I think that Mr. Dixon has done well to correct their error. Only I am not aware that any naturalist of note has allowed his belief in Darwinism thus to go beyond the teaching of Darwin.

GEORGE J. ROMANES

Scandinavian Ice-Flows

FAILING any more direct answer to Sir J. D. Hooker's query (NATURE, vol. xxxiii. p. 79), perhaps, with your usual courtesy, you will allow me space for one or two brief notes. The map referred to, as it stands in "Climate and Time," p. 449, is conjectural to a very large extent. If we are to take the relative closeness of the lines to indicate comparative depth and strength of the glacier-flow, the Baltic must have been, at the intensest period of glaciation, a glacier-filled valley, on an enormous scale, with the ice-stream passing out over the comparatively low, and then submerged, country of Schleswig-Holstein. Dr. Croll, to support a foregone conclusion, represents it thus, and then makes it bifurcate conjecturally about the Dogger Bank. One or two considerations, however, make Dr. Croll's conclusion less "inevitable" than he seems to imagine (p. 449).

(1) Admitting, as we must, that the striations mentioned (p. 448) on the Island of Bornholm, point to the passage of ice in massive proportions over at least that island in the *direction* indicated by the lines on the map, we may still call in question the hypothesis which regards the *main mass of the Baltic ice* as having passed that way.

For (2) the evidence given (p. 449) of its having passed over Denmark (the bare "fact that the surface of the country is strewn with debris derived from the Scandinavian peninsula") is so ambiguous as to be worthless on the point under consideration.

(3) The *facts* stated by Dr. Croll (stripped of the guise with which he has invested them) can be easily and naturally accounted for by the action of *marine* ice, owing its origin to the great Scandinavian glaciers of the period; some of which, even from the Baltic side, probably drifted away into the present North Sea basin.

But (4) that *the main mass* of the ice from the *eastern* slopes of the great glaciated Scandinavian range did not take this direction is proved by some of the best-established facts of European geology; facts which, had they been known to Dr. Croll, would have rendered, I venture to think, the construction by him of the map referred to impossible. On p. 447 he says, "After passing down the Baltic, a portion of the ice would probably move south into the flat plains in the north of Germany, but the *greater portion* would keep in the bed of the Baltic, and of course (*sic*) turn to the right round the south end of Gothland, and then cross over Denmark into the North Sea."

The *naïveté* of this statement, in a book bearing date 1875, is truly refreshing. Any one who knows the district of Jena is perfectly familiar with the enormous abundance of ice-transported material from Scandinavia to be found thereabouts; and these "Findlinge" are spread far and wide over the whole North-German plain as far inland as Bonn, Westphalia, Thüringen, Saxony (even to the south of Zwickau), and, according to Credner's later observations (*Sitzber. der naturforsch. Gesellsch. Leipzig*, 1875), into the interior of Bohemia, as far as Troppau, near the sources of the Oder, on the slopes of the Sudeten Gebirge, and even to Toulou and Moscow.

(5) Lastly, the occurrence of striated blocks of Scandinavian origin in the boulder-clays of the Yorkshire coast, is clearly incompatible with the conjectural view so graphically expressed on the map in question.

A. IRVING

Wellington College, November 30

The Resting Position of the Oyster

I FEEL some disinclination to take up more space in the pages of NATURE on this subject without making any new contribution to the discussion, but Mr. John A. Ryder's letter induces me to summarise the facts which have been brought forward, and the conclusions to be drawn from them. The condition of the oysters examined by me can only be explained by inferring that they were quite free, and resting on a flat bottom with the right valve downwards. The specimens of

Pecten opercularis which I had before me were in the same condition, and doubtless rested in the same position. Of *Pecten maximus* I cannot speak with certainty, and therefore leave to Mr. Arthur Hunt the responsibility of stating that there is a difference in respect of position in the two species. Prof. Möbius also finds that the left valves of oysters are usually covered by fixed animals, but as far as I understand his letter he thinks this does not prove that the left valves in this condition were uppermost: in the oysters I examined, the right valves were so clean that they must have been in close contact with the bottom. The other letters on the subject all describe evidence proving that oyster larvæ attach themselves by the left valve. This I did not deny, and I might of course easily have found the direct testimony of observers on the subject. Mr. Ryder says it is well known that the right valve of the oyster is always the most deeply pigmented, while the left one is paler; in the oysters I examined, the condition of the valves was exactly the reverse of this. It seems to me that when a young oyster is attached to the under-surface of a stone or shell by its left valve its right valve is lower, and if it drops from its attachment, or grows much larger than the stone or shell to which it is fixed, the surface of its right valve will come into close contact with the sea-bottom. I have seen oysters which still retained a piece of shell attached near the umbo of the left valve, while the rest of the valve was covered with fixed animals, and the right valve was quite clean and light in colour. There are no crowded oyster-banks in the Firth of Forth, and it might even be said that the oysters which came under my observation had been dredged and thrown overboard again at some time of their lives. But I do not think oysters are often returned to the water when once taken in the Firth. In my former letter I implied that probably in the normal position of an adult oyster the right valve was in contact with the bottom. That this is often the case when the oyster is free and has plenty of room has not yet been disproved, and therefore I think the current statement that the oyster, when not attached, invariably rests with its left valve downwards needs modification.

J. T. CUNNINGHAM

Scottish Marine Station, November 28

The Sea-Mills at Argostoli

I WILL be glad if, through the columns of your journal, you will be good enough to inform me what has been written in English concerning the phenomenon known as "The Sea-Mills at Argostoli." Having recently visited the island of Cephalonia I was able to examine these mills frequently, and I have reasons for believing that papers have been read at different times at some of the learned societies at home discussing the subject *in extenso*. I will therefore be glad of any intelligence on this interesting phenomenon which you may be able to refer me to.

J. LLOYD THOMAS

H.M.S. *Téméraire*, Mediterranean, November 15

Earthquake

ON Thursday morning, December 3, I was in bed awake, between 6 and 7 o'clock. I heard a slight clattering noise of the earthenware and glass articles on the marble top of the washstand. It lasted for about three seconds, and went with a slight halt near the end. There was no one moving in the house, and nothing outside to cause the tremors, which I did not feel in bed. I immediately got up to look at the clock, and found it was 6.45. I do not know at what time the earthquake in Algeria took place, possibly there was some connection between the two, and the tremor may have been felt in other places in England, so I record this.

Gateshead, December 6

R. S. NEWALL

VENTILATION

IN modern life, with its enormous populations living under artificial conditions in towns and cities, the subject of ventilation, or the supply of sufficient pure air to each individual for the maintenance of health, has assumed, as it has become more generally understood, a vast and national importance. Its importance has been clearly demonstrated in many instances by a greatly diminished death-rate in places where overcrowding on space or in houses, formerly existent, has been remedied,

and especially by a decrease in those diseases which are now generally recognised as preventible. Thus, since attention has been paid to the amount of cubic space and the supply of fresh air per head in barracks, the death-rate from phthisis or destructive diseases of the lungs in the army has fallen from 10 to 2 per 1000; and typhus, formerly very prevalent in the gaols of the country and in the crowded courts of our large cities, is now almost unknown in these situations. That there is still a vast amount of disease and death which could be prevented by a more general recognition of the absolute importance of a pure supply of fresh air under all conditions, is a fact whose truth we recognise when we observe the numbers of scrofulous and ricketty children and consumptive adults in our large centres of population. Many houses in the poorer parts of towns are absolutely debarred from obtaining fresh air and light by their surroundings. Built almost back to back, or fronting into narrow courts or passages closed at one or both ends, the sunlight never penetrates for months in the year, and a free current of air is an impossibility. Fortunately the Legislature has recognised this evil, and the Acts known as Sir Richard Cross's and Torrens's are intended to remedy such a state of things, and, where enforced, have succeeded in removing buildings which no structural alterations could improve. The erection of huge blocks of Industrial Dwellings, whilst affording vastly superior accommodation to the working classes, has not always secured efficient ventilation in these respects for certain of the tenements. We have seen instances of lofty blocks being built in such a way as to enclose a narrow and well-like court, in which the atmosphere is always stagnant, and from which the inner rooms derive all their light and air. Cottage buildings, with sufficient space in front and rear, are far preferable to lofty blocks placed in rows; but as they do not house the same number of people for the space occupied in crowded districts, where land is of such enormous value, the rents must necessarily be higher, the other accommodation being the same. The air of enclosed courts is often damp, and being stagnant allows suspended particles to fall and foul gases to accumulate in it, thus forming a suitable "nidus" for the growth and cultivation of such disease germs as are capable of existing in the air. It is true that the death-rates appearing in the reports of many of the Industrial Dwellings Companies' are exceptionally low, but we must remember that a very large proportion of the working classes die in hospitals and not in their own houses, and such sources of error require to be very carefully eliminated. Of late years Artizans' Dwellings have been built on better principles, the experience derived from the sanitary failures of certain of the earlier erections having been taken to heart.

In the model bye-laws of the Local Government Board it is provided that no new street is to be less than 36 feet in width, that the frontage of any new building not standing in a street shall be at least 24 feet in width, and that there shall be an open space at the rear of any new building and belonging to it of an aggregate extent of 150 square feet, this space not to be in any case less than 10 feet wide, and if the height of the building exceed 35 feet, to be not less than 25 feet wide. If these rules could be always enforced in the cases of new buildings an improvement would be gradually effected in and around towns in the poorer districts which is greatly needed.

From what has been said it will be seen that one of the principal points in any system of ventilation is that the air to be admitted into a building should be pure, and this can be ensured if there is no impediment to the free circulation of currents of air on the outside. We come now to the second part of the subject, viz. the vitiation of air that is constantly going on in inhabited places from the respiration of men and animals, and from the combustion of gas, lamps, and candles, and the methods by which this vitiated air may be replaced by pure external

air. The composition of the atmosphere is as follows in 1000 parts: nitrogen, 790.0; oxygen, 209.6; carbonic acid gas, .4, and traces of ozone, ammonia with nitrous and sulphurous acids in the air of towns, and a variable amount of aqueous vapour. The air taken into the lungs of a human being has this composition, but that expired differs from it in the following particulars, the nitrogen remaining the same: the oxygen which is the vital principle of air is diminished 4 per cent., the carbonic acid is increased 4 per cent., the expired air is saturated with aqueous vapour and is heated nearly to the temperature of the body, 98° Fahr., and contains a small proportion of foul, decomposing organic matter, which exists partly in the form of vapour and partly as solid suspended matter (epithelial dust and scales). This organic matter, though small in amount, is the most injurious quality of expired air, giving to the atmosphere of an ill-ventilated room its close and disagreeable smell. Those who are familiar with the interiors of courts of law, with the pits and galleries of theatres, or with crowded buildings generally, are also familiar with the headaches, the lassitude, and the "malaise" produced by breathing for some hours a vitiated atmosphere. In analyses of such air nearly ten times more carbonic acid has been found than is normally present in the outer air, and when this excess is known to mean a deficiency in oxygen and a corresponding excess in organic vaporous exhalations and suspended matter from the breath and bodies of the persons present, the foul nature of the atmosphere can be realised. The slow deterioration in health, which results from the constant breathing of foul air, is one of its most important results, and causes a predisposition to, and lessened power of, resistance to attacks of disease.

An adult man of average size takes in and breathes out, when at rest, about 30 cubic inches of air at each respiration, this act being performed about seventeen times in a minute, so that in one hour about 17 cubic feet of fresh air will have been vitiated to the extent of containing 4 per cent. of carbonic acid—that is to say, about .7 cubic foot. Such a man gives out when at rest, therefore, nearly .7 cubic foot carbonic acid gas per hour. Now it has been found by Dr. De Chaumont, by chemical examination of a large number of samples of the air of inhabited rooms, that the amount of carbonic acid in the outer air being .4 per 1000, no close smell is perceived in the air of a room until the carbonic acid reaches .6 per 1000, or exceeds by .2 per 1000 that in the outer air, the close smell being always due to the foul organic matter in the impure air, which increases *pari passu* with, and is therefore estimated by the amount of carbonic acid present. It has been assumed by De Chaumont, and experience has fully confirmed this assumption, that we can breathe with immunity air vitiated to this slight extent, but that we should not allow any greater vitiation. We may take it, therefore, that the object of ventilation is to supply sufficient pure air to a room to prevent the carbonic acid rising above .6 per 1000, this quantity being known as the limit of respiratory impurity. It may be asked why should not the air of our rooms be as pure as the air outside? No doubt this would be desirable, were it not that it involves a continual renewal of the inner air by the outer, which means in cold weather an unceasing draught at an unbearable temperature. We have seen that an ordinary adult man expires .7 cubic foot of carbonic acid in one hour when at rest, now if such an individual were enclosed in an airtight chamber, 10 feet high, 10 feet wide, and 10 feet long—that is to say, in a chamber containing 1000 cubic feet space—in one hour the carbonic acid in this chamber would have had added to it .7 cubic foot of carbonic acid; the air originally contained .4 parts of carbonic acid in 1000 parts, so that after one hour it would contain $.4 + .7 = 1.1$ parts of carbonic acid per 1000, or $1.1 - .6 = .5$ parts per 1000 above the permissible limit for health. But if the subject of our experiment were enclosed in a room containing 3500

cubic feet of space, in one hour the amount of carbonic acid would be only $\frac{3.5 \times 4 + 7}{3.5} = .6$ per 1000, *i.e.* the

limit would have just been reached, and at the end of a second hour, to keep the carbonic acid to this limit, another 3,500 cubic feet of fresh air must have been allowed to enter the room. That is to say, an adult man requires when at rest 3500 cubic feet of fresh air per hour; a woman or child requires proportionally less. For any individual above twelve years of age, we may take as an average the amount of carbonic acid expired per hour as .6 cubic foot, and for such an average individual 3000 cubic feet of fresh air per hour is necessary. We can now appreciate the importance of cubic space, for if we are to supply 3000 cubic feet of fresh air to every individual above twelve years in a room, and the amount of space, suppose, in a dormitory where ten persons sleep is only 300 cubic feet per head, then 30,000 cubic feet of fresh air must be supplied per hour—that is to say, the air of the dormitory must be completely changed ten times in this period, a proceeding which would cause in any but the very warmest weather a very disagreeable draught. But if the cubic space per head be 1000 feet, then the air of the dormitory need be changed only three times per hour, and if such renewal be effected steadily and gradually no draught need be felt. We may mention here that a certain amount of superficial or floor space is necessary for each individual, for if the height of the room is much over 12 feet, excess in this direction does not compensate for deficiency in the other dimensions, although the cubic space may be the same; thus it would not be the same thing to allow a man 50 square feet of floor space in a room 20 feet high, as to allow him 100 square feet of floor space in a room 10 feet high, although the amount of space allotted to him in each case would be the same. It may be interesting here to mention that in common lodging houses under police regulations, 240 cubic feet of space are allotted to each adult, in barracks about 600 cubic feet, in general hospitals about 1000 cubic feet as a rule, and in infectious fever hospitals from 1500 to 3500 cubic feet—in these latter institutions the floor space allowed per bed is from 150 to 300 square feet. From the report of the royal commission on the housing of the working classes it would appear that even the low allowance of the common lodging houses is very often not attained in the crowded rooms of tenement houses, and an enormous number of cellars are still inhabited in our large towns, although they presumably come up to the requirements of the Public Health Acts as regards their ventilation.

Gas, candles, and lamps use up oxygen and produce carbonic acid and water. A cubic foot of coal gas produces, when burnt, 2 cubic feet of carbonic acid, and since a common burner consumes 3 cubic feet of gas in an hour, it produces 6 cubic feet of carbonic acid in the same period. Therefore, as much air should be supplied to dilute the products of its combustion as would be necessary for three or four men. It is far better, however, to use such gas-lamps as are shut off from the air of the room. These receive the air necessary for combustion from without, and the products of combustion are carried off by a special channel to the outer air. The electric light uses none of the oxygen of the air and gives off no carbonic acid nor water, and is for these reasons far preferable to naked flames for lighting purposes.

Ventilation is said to be carried on by natural or by artificial means. In the former are included (1) diffusion of gases; (2) action of the wind by perflation and aspiration; (3) movements caused by differences in weight of masses of air at different temperatures. By the latter, although the same principles are involved, is meant exhaustion of air by heat or by steam from apartments, or propulsion of air into such spaces by mechanical means, as fans. Diffusion causes a rapid mixing of different gases placed in contiguity; thus the gaseous impurities of respired air mix with the fresh air in a room until homogeneity is

established. Diffusion, however, does not affect the suspended matters which tend to fall in a still atmosphere. Consequently organic matters which exist principally as minute solids in a state of suspension in the air, are not affected or removed by diffusion. The wind when in motion causes a partial vacuum in the interior of tubes, such as chimneys and ventilating shafts placed at right angles to its course. The air in these tubes being thus partially aspirated or sucked out by the action of the wind, to restore the temporary vacuum so made, air from below rushes up to take its place, a continual current in a perpendicular direction being thus set up. Perflation by winds is the setting in motion of masses of air by the impact of other masses. This action is illustrated when the windows on opposite sides of the room are fully open. The room is rapidly and continually flushed with air, an enormous effect being produced, for it has been estimated that the air of such a room may be renewed many hundred times an hour, even when the movement of air outside is only 2 miles an hour or $1\frac{1}{2}$ feet per-second, equivalent to a very gentle and almost imperceptible breeze. Such a method is of unquestionable utility for rapidly changing the air of an unoccupied room, and may be generally put in operation in summer in inhabited rooms when the temperatures outside and inside the house approximate. In any system of ventilation that depends entirely on the wind there is always the difficulty of regulating the velocity of the current according to the amount of movement of the air, and during complete calms the action is nil. For ventilating the holds and interiors of ships at sea, the wind may be most advantageously utilised. A cowl placed so as to face to the wind conducts the air below, whilst another reversed so as to back to the wind allows the used air to escape.

The movement due to masses of air at different temperatures is the natural force chiefly relied on for ventilating the interior of houses. The air of inhabited rooms in this climate, except in warm summer weather, is at a higher temperature than the outer air; hot air is lighter than cold air, and will rise for cold air to take its place—in fact, heated air is displaced upwards by colder and denser air. In a room as usually constructed with sash windows, with a fire-place and chimney, but without any special means of ventilation, when a fire is burning in the grate the heated air of the room in part ascends the chimney-flue, and in part rises to the ceiling. Cold air from outside will then enter, if the windows be closed, under the door, under the skirting boards, between the sashes of the window, and through any other chinks or apertures due to loose fittings. The bricks and plaster of the walls are also porous to a slight extent, and if not covered with paint or wall paper will admit air to a limited extent. Thus a large volume of air may be entering a room in cold weather when the fire is burning although there be no visible inlets, and the amount of air thus supplied may be sufficient for the needs of two or three persons if it were properly distributed. But such is not the case. The cold air, which enters chiefly near the floor, takes as straight a course as possible to the fire-place, producing a disagreeable draught to the feet of the occupants, whilst the heated and vitiated air near the ceiling is left undisturbed. It has been found practically that to prevent draughts, and to ensure a thorough distribution, fresh air should be admitted into a room above the heads of the occupants, an upward direction being given to it, so that it may impinge on the ceiling, mix with, and be warmed by, the heated air in this situation, fall gently into all parts of the room, and be gradually removed by means of the chimney-flue or any other outlet. The inlet openings for fresh air now most in use are intended to serve this purpose. For sash windows Hinckes Bird's method, now so well known, of placing a solid block of wood under the lower sash of the window so as to raise the top of the lower sash above the

bottom of the upper, admits the air in an upward direction to the ceiling above the heads of the occupants. Holes bored in a perpendicular direction in the bottom of the upper sash, louvered panes to replace one of the squares of glass, an arrangement for allowing one of the squares of glass to fall inwards upon its lower border and providing it with side cheeks, or a double pane of glass in one square open at the bottom outside and at the top inside—all effect the same purpose and are simple and inexpensive contrivances. Wall inlet ventilators, as the Sherringham valve and Tobin's tubes, are constructed on the same principles, fresh air, which in towns may be filtered through muslin or cotton wool, or made to impinge upon a tray containing water so as to deposit its sooty particles, being admitted at a height of about 6 feet from the floor and directed upwards towards the ceiling. The usual outlet for vitiated air is the chimney-flue, and this for an ordinary medium-sized sitting-room, with a fire burning, is sufficient for three or four people, provided no gas is alight, or the gas lamp has its own special ventilating arrangements. With an ordinary fire, from 10,000 to 15,000 cubic feet of air are drawn up the chimney in an hour. Valves placed so as to open into the flue near the ceiling are sometimes used as outlets for foul air, such as Neil Arnott's and Boyle's valves, which permit air to pass into the flue, but prevent its return; the only objections to their use are that they occasionally permit the reflux of smoke into the room, and their movements backwards and forwards cause a slight clicking noise. In all new buildings where efficient ventilation is desired, it would be preferable to construct a shaft at one side of, or surrounding the chimney-flue, with an inlet near the ceiling of the room and the outlet at the level of the chimney top, so that the air escaping from the room would have its temperature kept up by contact with the chimney, thus aiding the updraught, whilst the risk of reflux of smoke would be avoided. In all new domestic buildings a very great improvement might be effected by providing for the warming of the air before its entry into the apartments. The window and wall inlet ventilators just described are occasionally productive of draughts in cold weather, so that it is more usual to find them closed or stopped up than in action, or else admitting a very insufficient supply of air; but if the air be warmed before admittance to an agreeable temperature a very large amount may be allowed to enter without the fact being known to the occupants. The ventilating stove invented by Captain Galton, the Manchester school grate, and other forms effect this purpose in the following manner: Behind the grate, which is lined with fire-clay, is a chamber into which fresh air is admitted by a pipe from the outside. The air, here warmed, is admitted into the room by a pipe opening at about the level of the chimney breast and guarded by a grating which can be opened or closed as found convenient. In the Manchester school grate the warmed air is admitted by vertical pipes, like Tobin's tubes, opening on a level with the chimney-piece. The danger in these grates is that cracks may be formed by the heat of the fire in the joints or in the cast-iron plates which surround the air chamber, and thus direct communication be established between the grate and air chamber with the result of deleterious products of combustion being admitted into the air of the room. When the stove is lined with fire-clay there is no danger of the air in the chamber being overheated, producing charring of the organic matter in the air and an offensive smell, which is so often noticed around stoves where this precaution has not been taken. In Mr. Saxon Snell's ventilating thermhydic stove the fresh air is warmed by passing over hot water pipes in the stove before entrance into the room, the hot water being derived from a small boiler at the back of the grate. The temperature of the water is not high enough to overheat the air.

Gas is being gradually introduced for heating purposes,

and with a reduction in its price we may look forward to its more extended use. There are several ventilating gas stoves by which air is admitted into a room warmed after passing through the stove. It is important to regulate the heat carefully so as not to overheat the stove and the air which is passing through. In churches and other public buildings air is usually warmed before entry by passing over hot water pipes which circulate around the building under the floor. In all large buildings the combustion of gas may be made a very effective means of getting rid of foul air. It has been found by experiment that the combustion of one cubic foot of coal gas causes the discharge of 1000 cubic feet of air. In theatres where gas, although being gradually replaced by the electric light, is still much used, the extraction of foul air from the roof of the building by the sunlight burners presents no difficulty. The difficulty experienced is the introduction of fresh air from below without causing draughts. In private houses the use of an extraction shaft over the gas chandelier or a Benham's ventilating globe light, or a Mackinnell's ventilator greatly aid the extraction of foul air from the ceiling, whilst the two latter are also useful in providing inlets for fresh air which enters slightly warmed near the ceiling, and is then directed horizontally by flanges so as to be distributed over the room. Outlets in the ceiling of a room may become inlets when a strong fire is burning, as the draught up the chimney will overbalance the extractive power of the gas and cause all other openings into the room to be inlets. We may here mention an ingenious method for warming the air admitted by Tobin's tubes into a room: a row of small Bunsen burners encircles the tube at its foot, and the products of combustion are conveyed away by a tube which surrounds the Tobin and opens into the outer air.

In large public buildings, where expense is no object, a combined method of ventilation by propulsion and extraction presents many advantages. The amount of air admitted can be easily regulated, warmed, cooled, or moistened, and freed from impurities by filtration, and enormous volumes are capable of being so supplied by propulsion and removed by the extractive powers of a furnace. In the Houses of Parliament where this system is in operation, air is propelled by rotatory fans along conduits to the basement, where it is warmed in winter by passing over steam pipes, and then passes upwards through shafts into the space beneath the grated floor of the House. The heat can be regulated by covering the steam pipes with woollen cloths, and in summer the entering air can be sprayed with water or cooled by passing over ice in the conduits. The vitiated air in the House passes through a perforated glass ceiling in the roof, and is then conducted by a shaft to the basement of the Clock Tower, where it passes into the flue of a large furnace.

The introduction of electricity for lighting and of gas for heating purposes will, in the case of both public and private buildings, considerably modify the methods of ventilation now most generally used.

CYCLES

THE Institute of Mechanical Engineers held a general meeting in the Corn Exchange, Coventry, on the afternoon of Wednesday, October 28, Mr. Jeremiah Head, President, in the chair, when the Secretary read a paper by Mr. R. E. Phillips, of London, "On the Construction of Modern Cycles," of which an abstract follows:—

The cycle industry in this country has grown with such rapidity and has already assumed proportions of such magnitude as to lead the author to hope that the present paper may prove of some interest to the Institution. It would not be possible within any reasonable limits to do justice to all matters connected with cycles; and he therefore purposes dealing only with their general con-